

# PATENT ABSTRACTS OF JAPAN

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(21)Application number : 08-197074 (71)Applicant : NOK CORP

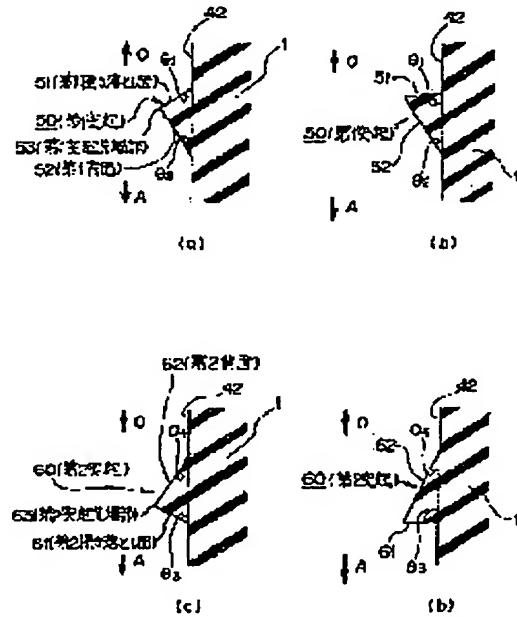
(22)Date of filing : 08.07.1996 (72)Inventor : NAGASAWA SHINJI

## (54) SEALING DEVICE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a sealing device including excellent holding properties, which prevents frictional resistance between the sealing device and its mounting surface from being reduced, and thereby holds the mounting surface in a specified position.

**SOLUTION:** A first projection 50 and a second projection 60 each of which is in a triangle shape in cross section made out of a rubber like elastic body, are provided for the side of fluid O subjected to sealing the circumferential surface 42 of a fit-in part for an oil seal (sealing device) 1 and the side of fluid A subjected to anti-sealing respectively. An angle formed by the first raking surface 51 of the first projection 50 and the circumferential surface 42 of the fit-in part, is made  $\theta_1$ , and an angle formed by a first back face 52 and the circumferential surface 42 of the fit-in part, is made  $\theta_2$ , and  $\theta_1$  and  $\theta_2$  are thereby so set as to be  $\theta_1 > \theta_2$ . An angle formed by the second raking surface 61 of the second projection 60 and the circumferential surface 42 of the fit-in part, is made  $\theta_3$ , and an angle formed by a second back face 62 and the circumferential surface 42 of the fit-in part, is made  $\theta_4$ , and  $\theta_3$  and  $\theta_4$  and thereby so set as to be  $\theta_3 > \theta_4$ .



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**CLAIMS**

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**[Claim(s)]**

[Claim 1] In the sealing device which is attached in the clamp face established in one of members among two members each other attached in the said alignment, and seals between these 2 members It scratches one. the [ for failing to scratch the foreign matter adhering to said clamp face, in case it inserts in the peripheral surface of the attachment section of this sealing device towards the side for seal ] -- with the dropping section the [ for failing to scratch the foreign matter adhering to said clamp face, in case it inserts towards the side for anti-seal ] -- the sealing device characterized by having scratched two and having the dropping section.

[Claim 2] One, it scratches and the dropping section is the 1st projection of the shape of a cross-section triangle which consists of a member in which elastic deformation is possible. the [ said ] -- the side slant face for seal of this 1st projection It scratches two. the side slant face for anti-seal -- said attachment section peripheral surface -- receiving -- a steep inclination -- having -- the [ said ] -- the dropping section It is the sealing device which consists of the 2nd projection of the shape of a cross-section triangle which consists of a member in which elastic deformation is possible, and is characterized by the side slant face for anti-seal of this 2nd projection having a steep inclination from the side slant face for seal to said attachment section peripheral surface.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

[Field of the Invention] This invention relates to the sealing device used for the shaft seal part of power steering of an automobile etc.

**[0002]**

[Description of the Prior Art] As a direction of [ at the time of inserting the oil seal 1 as a sealing device in the cylinder 2 of the shaft seal part of power steering of an automobile conventionally ], there are both directions of the direction of arrow-head O of drawing 1 and the direction of arrow-head A.

[0003] After attaching oil seal 1 from the direction of one of the above and assembling a shaft seal part, vacuum suction of the inside of a shaft-seal-part assembly is carried out, it is made negative pressure, and an oil is enclosed.

**[0004]**

[Problem(s) to be Solved by the Invention] However, when an oil, grease, etc. had adhered to the inner skin of the cylinder 2 as the clamp face or the granularity of inner skin was fine, the coefficient of friction mu between oil seal 1 and the inner skin of a cylinder 2 became small, and there was a case where oil seal 1 could not move in the inside of a cylinder 2, and could not hold to a position, but was inferior to a maintenance property at the process of vacuum suction.

[0005] The place which it is made in order that this invention may solve the technical problem of the above-mentioned conventional technique, and is made into the purpose is to offer the sealing device which has the outstanding maintenance property which can prevent reduction of the frictional resistance between a sealing device and the clamp face, and can be held to a position.

**[0006]**

[Means for Solving the Problem] In the sealing device which the 1st invention is attached in the clamp face established in one of members among two members each other attached in the said alignment in order to solve the above-mentioned technical problem, and seals between these 2 members It scratches one. the [ for failing to scratch the foreign matter adhering to said clamp face, in case it inserts in the peripheral surface of the attachment section of this sealing device towards the side for seal ] -- with the dropping section the [ for failing to scratch the foreign matter adhering to said clamp face, in case it inserts towards the side for anti-seal ] -- it is characterized by having scratched two and having the dropping section.

[0007] If it does in this way, also in case a sealing device will be turned and inserted in which direction of the side for seal and for anti-seal, it can be failed to scratch the foreign matter adhering to the clamp face. moreover, the oil adhering to the clamp face etc. -- the 1st -- scratching -- the [ the dropping section or ] -- since it scratches two, it fails to scratch by the dropping section and reduction of the frictional resistance between an attachment section peripheral surface and the clamp face can be prevented, the maintenance property of a sealing device improves.

[0008] It scratches one. the 2nd invention -- the 1st invention -- setting -- the [ said ] -- the dropping section It is the 1st projection of the shape of a cross-section triangle which consists of a member in which elastic deformation is possible. The side slant face for seal of this 1st projection It scratches two. the side slant face for anti-seal -- said attachment section peripheral surface -- receiving -- a steep inclination -- having -- the [ said ] -- the dropping section It is the 2nd projection of the shape

of a cross-section triangle which consists of a member in which elastic deformation is possible, and the side slant face for anti-seal of this 2nd projection is characterized by having a steep inclination to said attachment section peripheral surface from the side slant face for seal.

[0009] Here, as a member in which elastic deformation is possible, there may be a rubber-like elasticity object etc., and the cross-section configuration of the 1st projection and the 2nd projection may not be restricted to a triangle, and may be a trapezoid etc.

[0010] Also in case a sealing device will be turned and inserted in which direction of the side for seal and for anti-seal since contact pressure distribution of an attachment section peripheral surface becomes high in the parts of the 1st projection and the 2nd projection if it does in this way, it can be failed to scratch the foreign matter adhering to the clamp face.

[0011] Since the side slant face for seal of the 1st projection contacts a foreign matter and fails to scratch this in case a sealing device is turned and inserted in the side for seal, it scratches, so that the inclination to the attachment section peripheral surface of the side slant face for seal is steep, and the dropping effectiveness is large. However, when the inclination to the attachment section peripheral surface of the side slant face for seal is enlarged, in having enlarged similarly the inclination to the attachment section peripheral surface of the side slant face for anti-seal, elastic deformation for the flank for seal of the 1st projection cannot be absorbed by part for the flank for anti-seal, but the 1st projection itself may be damaged. Therefore, from the side slant face for anti-seal, if it is made for the side slant face for seal of the 1st projection to have a steep inclination to an attachment section peripheral surface, it aims at reinforcement of the 1st projection and can fail to scratch the foreign matter which adhered to the clamp face more certainly. Since it was made for the side slant face for anti-seal of the 2nd projection to have a steep inclination from the side slant face for seal to an attachment section peripheral surface also about the 2nd projection, similarly, it can be failed for reinforcement of the 2nd projection to be aimed at and to scratch the foreign matter which adhered to the clamp face more certainly.

[0012] Moreover, since it fails to scratch the oil adhering to the clamp face etc. by the 1st projection or the 2nd projection and reduction of the frictional resistance between an attachment section peripheral surface and the clamp face can be prevented, the maintenance property of a sealing device improves.

[0013] Furthermore, since contact pressure becomes high and is hard the clamp face in the 1st projection and the 2nd projection part, the frictional resistance between an attachment section peripheral surface and the clamp face can be increased, and the maintenance property of a sealing device improves further.

[0014] In addition, when contact pressure becomes high in the 1st projection and the 2nd projection part, improvement in seal nature can also be aimed at.

[0015]

[Embodiment of the Invention] Hereafter, this invention is explained based on the operation gestalt of illustration.

[0016] (1st operation gestalt) Drawing 1 is the important section sectional view showing the condition of having attached the oil seal 1 as a sealing device concerning the 1st operation gestalt of this invention in the cylinder 2.

[0017] Oil seal 1 consists of the approximately cylindrical guard ring 3 and the seal section 40 baked on this guard ring 3 at one.

[0018] The guard ring 3 is metal and consists of a cylinder part 31 prolonged in shaft orientations, and a flange 32 prolonged in a bore side from the fluid side edge section for anti-seal of a cylinder part 31.

[0019] It is a product made from a rubber-like elasticity object like rubber, and the seal section 40 consists of a seal lip 42 prepared mainly in the attachment section 41 prepared in the periphery side of the guard ring cylinder part 31, and the bore side edge section of the guard ring flange 32.

[0020] From the bore side edge section of the guard ring flange 32, a seal lip 42 is prolonged in the direction of the fluid side shaft alignment for seal, and \*\*\*\*'s on an axial (not shown) periphery in point 42a. The outer-diameter side of point 42a is equipped with the annular spring 5, and the seal lip 42 is energized to shaft orientations. Moreover, from the bore side edge section of the guard ring flange 32, the dust lip 43 is prolonged towards the direction of the fluid side shaft alignment for anti-

seal, and it \*\*\*\*s on an axial (not shown) periphery.

[0021] From the bore of a cylinder 2, it is set as a major diameter a little, predetermined interference is prepared, and the attachment section peripheral surface 42 formed in parallel with shaft orientations is carrying out the pressure welding of the attachment section 41 to the inner skin 20 as the clamp face of a cylinder 2.

[0022] The cross-section triangle-like 1st projection 50, and the 2nd projection 60 are formed in the fluid [ of the attachment section peripheral surface 42 ] O for seal, and fluid A side for anti-seal, respectively.

[0023] The 1st projection 50 and the 2nd projection 60 consist of a rubber-like elasticity object as a member in which elastic deformation is possible, and are prepared in the seal section 40 and one.

[0024] it is shown in drawing 2 (a) -- as -- the 1st projection 50 -- the [ by the side of the fluid O for seal ] -- it scratches one and consists of a dropping side 51 and the 1st tooth back 52 by the side of the fluid A for anti-seal. the 1st -- scratching -- the include angle of the dropping side 51 and the attachment section peripheral surface 42 to make -- the include angle of theta 1, the 1st tooth back 52, and the attachment section peripheral surface 42 to make -- theta 2 \*\* -- carrying out -- theta1 > theta2 it becomes -- as -- theta 1 and theta 2 It has set up. Moreover, the point 53 by the side of the outer diameter of the 1st projection 50 is making the tip.

[0025] In inserting oil seal 1 in the direction of arrow-head O to a cylinder 2, projection 50 carries out a pressure welding to the cylinder inner skin 20. In 1st projection 50 part, contact pressure distribution becomes high and forms a peak in about 53 point. for this reason, foreign matters, such as an oil adhering to the cylinder inner skin 20, -- the [ of the 1st projection 50 ] -- it scratches one and it is failed with insertion of oil seal to scratch the dropping side 51. Therefore, the fall of the coefficient of friction mu by the oil adhering to the cylinder inner skin 20 can be prevented, and the maintenance property of oil seal 1 can be raised. here -- theta 1 large -- carrying out -- the -- by scratching one and enlarging the inclination of a dropping side, an oil can scratch and the dropping effectiveness can be enlarged. theta 1 the case where it enlarges -- theta2 >= theta1 \*\* -- if it carries out -- the time of insertion -- a part for the 1st tooth-back flank of the 1st projection 50 -- the -- it is damaged without the elastic deformation by the pressure which scratches one and acts on a dropping side being unabsorbable, and enough -- it scratches and the dropping effectiveness may not be acquired. Therefore, at this operation gestalt, it is theta1 > theta2. It sets up, and the 1st projection is reinforced and it enables it have failed to scratch a foreign matter more certainly by making the 1st tooth back into a gentle slope.

[0026] Moreover, since contact pressure becomes high and is hard cylinder inner skin 20 in 1st projection 50 part as mentioned above, the frictional resistance between the cylinder inner skin 20 can be increased, and the maintenance property of oil seal 1 can be raised.

[0027] Furthermore, in 1st projection 50 part, when contact pressure becomes high, the seal nature by the side of an outer diameter improves.

[0028] Since the oil film formed between a point 53 and the cylinder inner skin 20 by using the point 53 of the 1st projection as a tip becomes thin, the effectiveness which fails to scratch the oil adhering to the cylinder inner skin 20 is large, and seal nature's improves.

[0029] theta 1 It can set up suitably from the range of  $0 < \theta_1 \leq 90$  degree, and you may make it become 90 degrees about a value, as shown in drawing 2 (b). However, theta 1 Since processing etc. will become difficult if it is made an obtuse angle, it is desirable to set up in the above-mentioned range.

[0030] it is shown in drawing 2 (c) -- as -- the 2nd projection 60 -- the [ by the side of the fluid A for anti-seal ] -- it scratches two and consists of a dropping side 61 and the 2nd tooth back 62 by the side of the fluid O for seal. the 2nd -- scratching -- the include angle of the dropping side 61 and the attachment section peripheral surface 42 to make -- the include angle of theta 3, the 2nd tooth back 62, and the attachment section peripheral surface 42 to make -- theta 4 \*\* -- carrying out -- theta3 > theta4 it becomes -- as -- theta 3 and theta 4 It has set up. Moreover, the point 63 by the side of the outer diameter of the 2nd projection 60 is making the tip.

[0031] In inserting oil seal 1 in the direction of arrow-head A to a cylinder 2, the 2nd projection 60 carries out a pressure welding to the cylinder inner skin 20. In 2nd projection 60 part, contact pressure becomes high and forms a peak in about 63 point. for this reason, foreign matters, such as

an oil adhering to the cylinder inner skin 20, -- the [ of the 2nd projection 60 ] -- it scratches two and it is failed with insertion of oil seal 1 to scratch the dropping side 61. Therefore, the fall of the coefficient of friction  $\mu_u$  by the oil adhering to the cylinder inner skin 20 can be prevented, and improvement in the maintenance property of oil seal 1 can be aimed at. It is  $\theta_3 > \theta_4$  like the 1st projection 50 also here. In case it carries out and oil seal 1 is inserted in the fluid A side for anti-seal, it enables it have failed to scratch a foreign matter more certainly.

[0032] Moreover, since contact pressure becomes high and is hard cylinder inner skin 20 in 2nd projection 60 part as mentioned above, the frictional resistance between the cylinder inner skin 20 can be increased, and the maintenance property of oil seal 1 can be raised.

[0033] Furthermore, in 2nd projection 60 part, when contact pressure becomes high, the seal nature by the side of an outer diameter improves.

[0034] Since the oil film formed between a point 63 and the cylinder inner skin 20 by using the point 63 of the 2nd projection as a tip becomes thin, the effectiveness which fails to scratch the oil adhering to the cylinder inner skin 20 is large, and seal nature's improves.

[0035]  $\theta_3$  It can set up suitably from the range of  $0 < \theta_3 \leq 90$  degree, and you may make it become 90 degrees about a value, as shown in drawing 2 (d). However,  $\theta_3$  Since processing and mold release will become difficult if it is made an obtuse angle, it is desirable to set up in the above-mentioned range.

[0036] Thus, since it can fail to scratch similarly the oil adhering to the cylinder inner skin 20 when inserting oil seal 1 in any of the direction of O, and the direction of A by forming the 1st projection 50 and the 2nd projection 60 in the attachment section peripheral surface 42, the fall of coefficient of friction  $\mu_u$  can be prevented and improvement in the maintenance property of oil seal 1 can be aimed at.

[0037] With this operation gestalt, the 1st projection 50 and the 2nd projection 60 are continuously formed over the perimeter. Although it is desirable for improvement in dropping [ scratch ] the oil adhering to the inner skin 20 of a cylinder 2, and seal nature to form the 1st projection 50 and the 2nd projection 60 continuously in perimeter, in order to increase the frictional resistance between the cylinder inner skin 20 and the oil seal attachment section peripheral surface 42, you may prepare in a hoop direction intermittently.

[0038] Moreover, with this operation gestalt, the 1st projection 50 and two articles of the 2nd projection 60 are formed in shaft orientations, respectively. Although you may form the 1st projection 50 and one articles of the 2nd projection 60 at a time, the effectiveness which the prepared direction mentioned above improves further.

[0039] With this operation gestalt, although the 1st projection 50 and the 2nd projection 60 are formed by the same member as the attachment section 41, the attachment section may be formed by another member. The 1st projection and the 2nd projection itself are not restricted to a single member, but you may make it form it by two or more members.

[0040] Moreover, it is not restricted to the thing of a configuration of that this operation gestalt also explained oil seal 1 body.

[0041] (2nd operation gestalt) Drawing 3 shows the 1st projection [ of the oil seal 10 concerning the 2nd operation gestalt of this invention ] 150, and 2nd projection 160 circumference.

[0042] Since it is the same as the oil seal 1 concerning the 1st operation gestalt if the 1st projection 150 and the 2nd projection 160 are removed, the same sign is attached and explanation is omitted.

[0043] the 1st projection 150 -- the -- it is the same as that of the oil seal 1 which scratches one and is applied to the 1st operation gestalt about the dropping side 51 and the 1st tooth back 52, and differs only in the configuration of the point 153 by the side of an outer diameter.

[0044] foreign matters, such as an oil which had adhered to the cylinder inner skin 20 like this operation gestalt also considering the cross-section configuration of the 1st projection point 153 as an approximate circle arc since predetermined interference was prepared in the attachment section 41, -- the [ of the 1st projection 150 ] -- it scratches one and it is failed with insertion of oil seal to scratch the dropping side 51. Therefore, the fall of the coefficient of friction  $\mu_u$  by the oil adhering to the cylinder inner skin 20 can be prevented, and improvement in the maintenance property of oil seal 10 can be aimed at.

[0045] Moreover, since contact pressure becomes high and is hard cylinder inner skin 20 in 1st

projection 150 part as mentioned above, the frictional resistance between the cylinder inner circumference 20 can be increased, and the maintenance property of oil seal 10 can be raised.

[0046] Furthermore, in 1st projection 150 part, when contact pressure becomes high, the seal nature by the side of an outer diameter improves.

[0047] the 2nd projection 160 -- it is the same as that of the oil seal 1 which scratches two and is applied to the 1st operation gestalt about the dropping side 61 and the 2nd tooth back 62, and differs only in the configuration of the point 163 by the side of an outer diameter.

[0048] foreign matters, such as an oil with which the 2nd projection point 163 is also made into the cross-section approximate circle arc, and had adhered to the cylinder inner skin 20 similarly with this operation gestalt, -- the [ of the 2nd projection 160 ] -- it scratches two and can fail to scratch with insertion of oil seal according to the dropping side 61. Therefore, the fall of the coefficient of friction mu by the oil adhering to the cylinder inner skin 20 can be prevented, and the maintenance property of oil seal 10 can be raised.

[0049] Moreover, since contact pressure becomes high and is hard cylinder inner skin 20 in 2nd projection 160 part, the frictional resistance between the cylinder inner circumference 20 can be increased, and the maintenance property of oil seal 10 can be raised.

[0050] Furthermore, in 2nd projection 160 part, when contact pressure becomes high, the seal nature by the side of an outer diameter improves.

[0051]

[Effect of the Invention] It scratches one. the [ for failing to scratch the foreign matter adhering to the clamp face, in case it inserts in the peripheral surface of the attachment section of a sealing device towards the side for seal according to the 1st invention, as explained above ] -- with the dropping section the [ for failing to scratch the foreign matter adhering to the clamp face, in case it inserts towards the side for anti-seal ] -- since it scratched two and had the dropping section, also in case a sealing device is turned and inserted in which direction of the side for seal and for anti-seal, it can be failed to scratch the foreign matter adhering to the clamp face moreover, the oil adhering to the clamp face etc. -- the 1st -- scratching -- the [ the dropping section or ] -- since it scratches two, it fails to scratch by the dropping section and reduction of the frictional resistance between an attachment section peripheral surface and the clamp face can be prevented, the maintenance property of a sealing device improves.

[0052] according to the 2nd invention -- the -- the 1st projection of the shape of a cross-section triangle which it scratches one and the dropping section becomes from the member in which elastic deformation is possible -- it is -- the, since it is the 2nd projection of the shape of a cross-section triangle which it scratches and the dropping section becomes from the member in which elastic deformation is possible two Since contact pressure distribution of an attachment section peripheral surface becomes high in the parts of the 1st projection and the 2nd projection, also in case a sealing device is turned and inserted in which direction of the side for seal and for anti-seal, it can be failed to scratch the foreign matter between the clamp face and an attachment section peripheral surface.

[0053] From the side slant face for anti-seal, if it is made for the side slant face for seal of the 1st projection to have a steep inclination to an attachment section peripheral surface, it aims at reinforcement of the 1st projection and can fail to scratch the foreign matter which adhered to the clamp face more certainly. Since it was made for the side slant face for anti-seal of the 2nd projection to have a steep inclination from the side slant face for seal to an attachment section peripheral surface also about the 2nd projection, similarly, it can be failed for reinforcement of the 2nd projection to be aimed at and to scratch the foreign matter which adhered to the clamp face more certainly.

[0054] Moreover, since it fails to scratch the oil adhering to the clamp face etc. by the 1st projection or the 2nd projection and reduction of the frictional resistance between an attachment section peripheral surface and the clamp face can be prevented, the maintenance property of a sealing device improves.

[0055] Furthermore, since contact pressure becomes high and is hard the clamp face in the 1st projection and the 2nd projection part, the frictional resistance between an attachment section peripheral surface and the clamp face can be increased, and the maintenance property of a sealing device improves further.

[0056] In addition, when contact pressure becomes high in the 1st projection and the 2nd projection part, improvement in seal nature can also be aimed at.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

**[Drawing 1] Drawing 1** is the important section sectional view of the oil seal concerning the 1st operation gestalt of this invention.

**[Drawing 2]** Drawing 2 (a) and (b) are the expanded sectional views of the 1st projection circumference of the oil seal concerning the 1st operation gestalt of this invention. Drawing 2 (c) and (d) are the expanded sectional views of the 2nd projection circumference of the oil seal concerning the 1st operation gestalt of this invention.

**[Drawing 3]** Drawing 3 (a) is the expanded sectional view of the 1st projection circumference of the oil seal concerning the 2nd operation gestalt of this invention. Drawing 3 (b) is the expanded sectional view of the 2nd projection circumference of the oil seal concerning the 2nd operation gestalt of this invention.

**[Description of Notations]**

- 1 Ten Oil seal
- 2 Cylinder
- 20 Cylinder Inner Skin
- 41 Attachment Section
- 42 Attachment Section Peripheral Surface
- 50,150 The 1st projection
- 51 the 1st -- Scratching -- Dropping Side
- 52 1st Tooth Back
- 60,160 The 2nd projection
- 61 the 2nd -- Scratching -- Dropping Side
- 62 2nd Tooth Back

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**[Translation done.]**

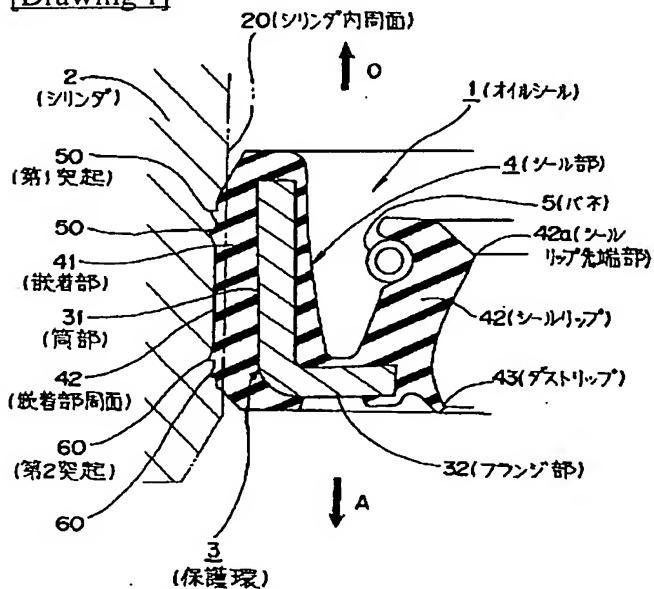
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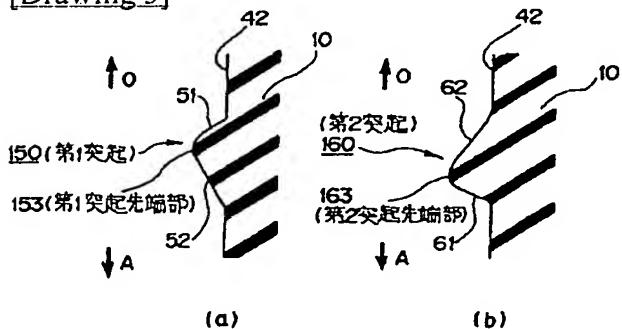
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## DRAWINGS

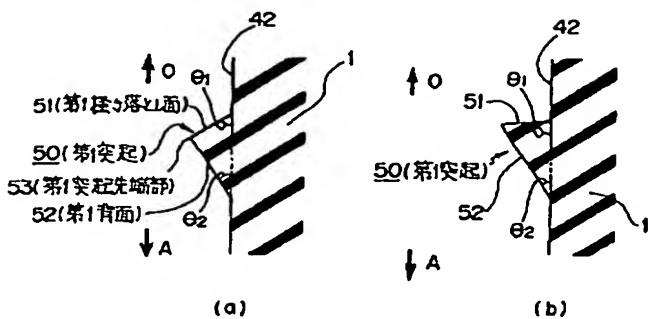
## [Drawing 1]



## [Drawing 3]

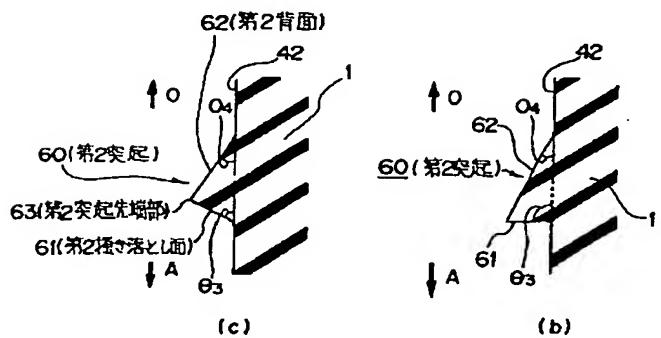


## [Drawing 2]



(a)

(b)



(c)

(b)

[Translation done.]

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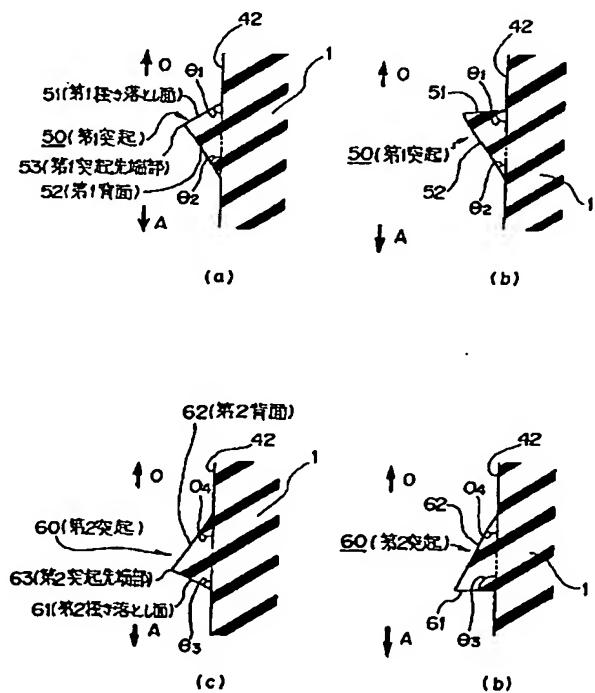
(71)出願人 000004385  
エヌオーケー株式会社  
東京都港区芝大門1丁目12番15号  
(72)発明者 長澤 晋治  
福島県福島市永井川字綾堀8番地エヌオーケー株式会社内  
(74)代理人 弁理士 世良 和信 (外2名)

(54)【発明の名称】 密封装置

(57)【要約】

【課題】 密封装置と取り付け面との間の摩擦抵抗の減少を防止して、所定の位置に保持することができる、優れた保持特性を有する密封装置を提供することにある。

【解決手段】 オイルシール(密封装置)1の嵌着部周面42の密封対象流体O側及び反密封対象流体A側には、それぞれゴム状弾性体製の断面三角形状の第1突起50、第2突起60が設けられている。第1突起50の第1挿き落とし面51と嵌着部周面42とのなす角度を $\theta_1$ 、第1背面52と嵌着部周面42とのなす角度を $\theta_2$ とし、 $\theta_1 > \theta_2$ となるように $\theta_1$ 、 $\theta_2$ を設定する。第2突起60の第2挿き落とし面61と嵌着部周面42とのなす角度を $\theta_3$ 、第2背面62と嵌着部周面42とのなす角度を $\theta_4$ とし、 $\theta_3 > \theta_4$ となるように $\theta_3$ 、 $\theta_4$ を設定する。



## 【特許請求の範囲】

【請求項1】互いに同心的に組み付けられる2部材のうちいずれか一方の部材に設けられた取り付け面に嵌着され、該2部材間を密封する密封装置において、該密封装置の嵌着部の周面上、密封対象側に向けて嵌入する際に、前記取り付け面に付着した異物を搔き落とすための第1搔き落とし部と、反密封対象側に向けて嵌入する際に、前記取り付け面に付着した異物を搔き落とすための第2搔き落とし部と、を備えたことを特徴とする密封装置。

【請求項2】前記第1搔き落とし部は、弾性変形可能な部材からなる断面三角形状の第1突起であり、該第1突起の密封対象側斜面は、反密封対象側斜面より、前記嵌着部周面に対して急な傾斜を有し、前記第2搔き落とし部は、弾性変形可能な部材からなる断面三角形状の第2突起からなり、該第2突起の反密封対象側斜面は、密封対象側斜面より、前記嵌着部周面に対して急な傾斜を有することを特徴とする密封装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、例えば、自動車のパワーステアリングの軸封部等に用いられる密封装置に関する。

## 【0002】

【従来の技術】従来、自動車のパワーステアリングの軸封部のシリンダ2に密封装置としてのオイルシール1を嵌入する際の方向としては、図1の矢印O方向及び矢印A方向の両方向がある。

【0003】オイルシール1を上記いずれかの方向から嵌着し、軸封部を組み立てた後に、軸封部組立体内を真空引きして負圧にし、油の封入を行う。

## 【0004】

【発明が解決しようとする課題】しかし、油、グリース等が取り付け面としてのシリンダ2の内周面に付着していたり、内周面の粗さが細かかったりするとオイルシール1とシリンダ2の内周面との間の摩擦係数 $\mu$ が小さくなり、真空引きの工程で、オイルシール1がシリンダ2内を移動してしまい、所定の位置に保持することができず保持特性に劣る場合があった。

【0005】本発明は、上記従来技術の課題を解決するためになされたものであって、その目的とするところは、密封装置と取り付け面との間の摩擦抵抗の減少を防止して、所定の位置に保持することができる、優れた保持特性を有する密封装置を提供することにある。

## 【0006】

【課題を解決するための手段】上記課題を解決するために第1の発明は、互いに同心的に組み付けられる2部材のうちいずれか一方の部材に設けられた取り付け面に嵌着され、該2部材間を密封する密封装置において、該密封装置の嵌着部の周面上、密封対象側に向けて嵌入する

際に、前記取り付け面に付着した異物を搔き落とすための第1搔き落とし部と、反密封対象側に向けて嵌入する際に、前記取り付け面に付着した異物を搔き落とすための第2搔き落とし部と、を備えたことを特徴とする。

【0007】このようにすれば、密封装置を密封対象側及び反密封対象側のいずれの方向に向けて嵌入する際にも、取り付け面に付着した異物を搔き落とすことができる。また、取り付け面に付着した油等を、第1搔き落とし部又は第2搔き落とし部によって搔き落とし、嵌着部周面と取り付け面との間の摩擦抵抗の減少を防止することができる、密封装置の保持特性が向上する。

【0008】第2の発明は、第1の発明において、前記第1搔き落とし部は、弾性変形可能な部材からなる断面三角形状の第1突起であり、該第1突起の密封対象側斜面は、反密封対象側斜面より、前記嵌着部周面に対して急な傾斜を有し、前記第2搔き落とし部は、弾性変形可能な部材からなる断面三角形状の第2突起であり、該第2突起の反密封対象側斜面は、密封対象側斜面より、前記嵌着部周面に対して急な傾斜を有することを特徴とする。

【0009】ここで、弾性変形可能な部材としては、ゴム状弹性体等があり、第1突起及び第2突起の断面形状は三角形に限られるものではなく、台形等であってもよい。

【0010】このようにすれば、嵌着部周面の接触圧力分布が第1突起及び第2突起の部分で高くなるので、密封装置を密封対象側及び反密封対象側のいずれの方向に向けて嵌入する際にも、取り付け面に付着した異物を搔き落とすことができる。

【0011】密封装置を密封対象側に向けて嵌入する際には、第1突起の密封対象側斜面が異物に接触してこれを搔き落とすので、密封対象側斜面の嵌着部周面に対する傾斜が急であるほど搔き落とし効果は大きい。但し、密封対象側斜面の嵌着部周面に対する傾斜を大きくした場合に、反密封対象側斜面の嵌着部周面に対する傾斜を同様に大きくしたのでは、第1突起の密封対象側部分の弾性変形を反密封対象側部分で吸収することができず、第1突起自体が損傷してしまう可能性がある。従って、第1突起の密封対象側斜面が、反密封対象側斜面より、嵌着部周面に対して急な傾斜を有するようすれば、第1突起の補強を図り、より確実に取り付け面に付着した異物を搔き落とすことができる。第2突起についても、第2突起の反密封対象側斜面が、密封対象側斜面より、嵌着部周面に対して急な傾斜を有するようにしたので、同様に、第2突起の補強を図り、より確実に取り付け面に付着した異物を搔き落とすことができる。

【0012】また、取り付け面に付着した油等を、第1突起又は第2突起によって搔き落とし、嵌着部周面と取り付け面との間の摩擦抵抗の減少を防止することができるので、密封装置の保持特性が向上する。

【0013】さらに、第1突起及び第2突起部分で接触圧力が高くなり、取り付け面にくい込むので、嵌着部周面と取り付け面との間の摩擦抵抗を増大させることができ、密封装置の保持特性がより一層向上する。

【0014】加えて、第1突起及び第2突起部分で接触圧力が高くなることにより、シール性の向上を図ることもできる。

### 【0015】

【発明の実施の形態】以下、本発明を図示の実施形態に基づいて説明する。

【0016】(第1の実施形態) 図1は、本発明の第1の実施形態に係る密封装置としてのオイルシール1を、シリンダ2に嵌着した状態を示す要部断面図である。

【0017】オイルシール1は、略筒状の保護環3と、この保護環3に一体に焼付けられたシール部40とからなる。

【0018】保護環3は、金属製で、軸方向に延びる筒部31と筒部31の反密封対象流体側端部から内径側に延びるフランジ部32とからなる。

【0019】シール部40は、例えばゴムのようなゴム状弾性体で、主として、保護環筒部31の外周側に設けられた嵌着部41と、保護環フランジ部32の内径側端部に設けられたシールリップ42とからなる。

【0020】シールリップ42は、保護環フランジ部32の内径側端部から密封対象流体側軸心方向に延び、先端部42aにおいて軸(図示せず)外周に摺接する。先端部42aの外径側には、環状のバネ5が装着されており、シールリップ42を軸方向に付勢している。また、保護環フランジ部32の内径側端部からは、反密封対象流体側軸心方向に向けてダストリップ43が延び、軸(図示せず)外周に摺接する。

【0021】嵌着部41は、シリンダ2の内径より若干大径に設定され、所定のしめしろが設けられており、軸方向に平行に形成された嵌着部周面42がシリンダ2の取り付け面としての内周面20に圧接している。

【0022】嵌着部周面42の密封対象流体O側及び反密封対象流体A側には、それぞれ断面三角形状の第1突起50、第2突起60が設けられている。

【0023】第1突起50、第2突起60は、弾性変形可能な部材としてのゴム状弾性体からなり、シール部40と一体に設けられている。

【0024】図2(a)に示すように、第1突起50は、密封対象流体O側の第1搔き落とし面51と反密封対象流体A側の第1背面52とからなる。第1搔き落とし面51と嵌着部周面42とのなす角度を $\theta_1$ 、第1背面52と嵌着部周面42とのなす角度を $\theta_2$ とし、 $\theta_1 > \theta_2$ となるように $\theta_1$ 、 $\theta_2$ を設定している。また、第1突起50の外径側の先端部53は、尖端をなしていない。

【0025】オイルシール1を、シリンダ2に対して矢印O方向へ嵌入する場合には、突起50がシリンダ内周面20に圧接する。接触圧力分布は、第1突起50部分で高くなり、先端部53近傍においてピークを形成する。このため、シリンダ内周面20に付着していた油等の異物は、第1突起50の第1搔き落とし面51によって、オイルシールの嵌入に伴い搔き落とされる。従つて、シリンダ内周面20に付着した油による摩擦係数 $\mu$ の低下を防止して、オイルシール1の保持特性を向上させることができる。ここで、 $\theta_1$ を大きくして第1搔き落とし面の傾斜を大きくすることにより、油の搔き落とし効果を大きくすることができます。 $\theta_1$ を大きくした場合に $\theta_2 \geq \theta_1$ とすると、嵌入の際に、第1突起50の第1背面側部分が第1搔き落とし面に作用する圧力による弾性変形を吸収できずに損傷してしまい、十分な搔き落とし効果が得られない可能性がある。そのため、本実施形態では、 $\theta_1 > \theta_2$ と設定し、第1背面を緩斜面とすることにより第1突起を補強し、より確実に異物を搔き落とせるようしている。

【0026】また、上述のように、第1突起50部分で、接触圧力が高くなり、シリンダ内周面20にくい込むため、シリンダ内周面20との間の摩擦抵抗を増大させてオイルシール1の保持特性を向上させることができる。

【0027】さらに、第1突起50部分で、接触圧力が高くなることにより、外径側のシール性が向上する。

【0028】第1突起の先端部53を尖端とすることにより、先端部53とシリンダ内周面20との間に形成される油膜が薄くなるので、シリンダ内周面20に付着した油を搔き落とす効果が大きく、シール性も向上する。

【0029】 $\theta_1$ の値については、 $0 < \theta_1 \leq 90^\circ$ の範囲から適宜設定することができ、図2(b)に示すように、 $90^\circ$ になるようにしてもよい。但し、 $\theta_1$ を鈍角にすると加工等が困難となるため、上記範囲で設定することが望ましい。

【0030】図2(c)に示すように、第2突起60は、反密封対象流体A側の第2搔き落とし面61と密封対象流体O側の第2背面62とからなる。第2搔き落とし面61と嵌着部周面42とのなす角度を $\theta_3$ 、第2背面62と嵌着部周面42とのなす角度を $\theta_4$ とし、 $\theta_3 > \theta_4$ となるように $\theta_3$ 、 $\theta_4$ を設定している。また、第2突起60の外径側の先端部63は、尖端をなしていない。

【0031】オイルシール1を、シリンダ2に対して矢印A方向へ嵌入する場合には、第2突起60がシリンダ内周面20に圧接する。接触圧力は、第2突起60部分で高くなり、先端部63近傍においてピークを形成する。このため、シリンダ内周面20に付着していた油等の異物は、第2突起60の第2搔き落とし面61によって、オイルシール1の嵌入に伴い搔き落とされる。従つて、シリンダ内周面20に付着した油による摩擦係数 $\mu$

の低下を防止することができ、オイルシール1の保持特性の向上を図ることができる。ここでも第1突起50と同様に、 $\theta_3 > \theta_1$ として、オイルシール1を反密封対象流体A側へ嵌入する際に、より確実に異物を掻き落とせるようにしている。

【0032】また、上述のように、第2突起60部分で、接触圧力が高くなり、シリンダ内周面20にくい込むため、シリンダ内周面20との間の摩擦抵抗を増大させてオイルシール1の保持特性を向上させることができる。

【0033】さらに、第2突起60部分で、接触圧力が高くなることにより、外径側のシール性が向上する。

【0034】第2突起の先端部63を尖端とすることにより、先端部63とシリンダ内周面20との間に形成される油膜が薄くなるので、シリンダ内周面20に付着した油を掻き落とす効果が大きく、シール性も向上する。

【0035】 $\theta_3$ の値については、 $0 < \theta_3 \leq 90^\circ$ の範囲から適宜設定することができ、図2(d)に示すように、 $90^\circ$ になるようにしてもよい。但し、 $\theta_3$ を鈍角にすると加工、離型が困難となるため、上記範囲で設定することが望ましい。

【0036】このように、第1突起50と第2突起60を嵌着部周面42に設けることにより、オイルシール1をO方向及びA方向のいずれに嵌入する場合にも、シリンダ内周面20に付着していた油を同様に掻き落とすことができるので、摩擦係数 $\mu$ の低下を防止してオイルシール1の保持特性の向上を図ることができる。

【0037】本実施形態では、第1突起50、第2突起60は、全周にわたって連続して設けられている。シリンダ2の内周面20に付着した油の掻き落とし及びシール性の向上のためには、第1突起50、第2突起60を全周的に連続して設けることが望ましいが、シリンダ内周面20とオイルシール嵌着部周面42との間の摩擦抵抗を増大させるためには、周方向に断続的に設けてもよい。

【0038】また、本実施形態では、第1突起50、第2突起60を、軸方向にそれぞれ2条設けている。第1突起50、第2突起60を1条ずつ設けてもよいが、複数設けた方が、上述した効果がより一層向上する。

【0039】本実施形態では、第1突起50及び第2突起60を嵌着部41と同一部材で形成しているが、嵌着部とは別部材で形成してもよい。第1突起及び第2突起自体も単一部材に限られず複数の部材で形成するようにしてもよい。

【0040】また、オイルシール1本体も本実施形態で説明した構成のものに限られるものではない。

【0041】(第2の実施形態)図3は、本発明の第2の実施形態に係るオイルシール10の第1突起150、第2突起160周辺を示す。

【0042】第1突起150及び第2突起160を除い

ては第1の実施形態に係るオイルシール1と同じなので、同様の符号を付して説明を省略する。

【0043】第1突起150は、第1掻き落とし面51、第1背面52については、第1の実施形態に係るオイルシール1と同様であり、外径側の先端部153の形状においてのみ異なる。

【0044】嵌着部41に所定のしめしろが設けられているため、本実施形態のように第1突起先端部153の断面形状を略円弧状としても、シリンダ内周面20に付着していた油等の異物は、第1突起150の第1掻き落とし面51によって、オイルシールの嵌入に伴い掻き落とされる。従って、シリンダ内周面20に付着した油による摩擦係数 $\mu$ の低下を防止して、オイルシール10の保持特性の向上を図ることができる。

【0045】また、上述のように、第1突起150部分で、接触圧力が高くなり、シリンダ内周面20にくい込むため、シリンダ内周面20との間の摩擦抵抗を増大させてオイルシール10の保持特性を向上させることができる。

【0046】さらに、第1突起150部分で、接触圧力が高くなることにより、外径側のシール性が向上する。

【0047】第2突起160も、第2掻き落とし面61、第2背面62については、第1の実施形態に係るオイルシール1と同様であり、外径側の先端部163の形状においてのみ異なる。

【0048】本実施形態では、第2突起先端部163も断面略円弧状としており、同様に、シリンダ内周面20に付着していた油等の異物を、第2突起160の第2掻き落とし面61によって、オイルシールの嵌入に伴い掻き落とすことができる。従って、シリンダ内周面20に付着した油による摩擦係数 $\mu$ の低下を防止して、オイルシール10の保持特性を向上させることができる。

【0049】また、第2突起160部分で、接触圧力が高くなり、シリンダ内周面20にくい込むため、シリンダ内周面20との間の摩擦抵抗を増大させてオイルシール10の保持特性を向上させることができる。

【0050】さらに、第2突起160部分で、接触圧力が高くなることにより、外径側のシール性が向上する。

【0051】

【発明の効果】以上説明したように、第1の発明によれば、密封装置の嵌着部の周面に、密封対象側に向けて嵌入する際に、取り付け面に付着した異物を掻き落とすための第1掻き落とし部と、反密封対象側に向けて嵌入する際に、取り付け面に付着した異物を掻き落とすための第2掻き落とし部と、を備えたので、密封装置を密封対象側及び反密封対象側のいずれの方向に向けて嵌入する際にも、取り付け面に付着した異物を掻き落とすことができる。また、取り付け面に付着した油等を、第1掻き落とし部又は第2掻き落とし部によって掻き落とし、嵌着部周面と取り付け面との間の摩擦抵抗の減少を防止す

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ることができるので、密封装置の保持特性が向上する。  
【0052】第2の発明によれば、第1搔き落とし部が、弾性変形可能な部材からなる断面三角形状の第1突起であり、第2搔き落とし部が、弾性変形可能な部材からなる断面三角形状の第2突起であるため、嵌着部周面の接触圧力分布が第1突起及び第2突起の部分で高くなるので、密封装置を密封対象側及び反密封対象側のいずれの方向に向けて嵌入する際にも、取り付け面と嵌着部周面との間の異物を搔き落とすことができる。

【0053】第1突起の密封対象側斜面が、反密封対象側斜面より、嵌着部周面に対して急な傾斜を有するようすれば、第1突起の補強を図り、より確実に取り付け面に付着した異物を搔き落とすことができる。第2突起についても、第2突起の反密封対象側斜面が、密封対象側斜面より、嵌着部周面に対して急な傾斜を有するようにしたので、同様に、第2突起の補強を図り、より確実に取り付け面に付着した異物を搔き落とすことができる。

【0054】また、取り付け面に付着した油等を、第1突起又は第2突起によって搔き落とし、嵌着部周面と取り付け面との間の摩擦抵抗の減少を防止することができるので、密封装置の保持特性が向上する。

【0055】さらに、第1突起及び第2突起部分で接触圧力が高くなり、取り付け面にくい込むので、嵌着部周面と取り付け面との間の摩擦抵抗を増大させることができ、密封装置の保持特性がより一層向上する。\*

\* 【0056】加えて、第1突起及び第2突起部分で接触圧力が高くなることにより、シール性の向上を図ることもできる。

#### 【図面の簡単な説明】

【図1】図1は、本発明の第1の実施形態に係るオイルシールの要部断面図である。

【図2】図2(a), (b)は、本発明の第1の実施形態に係るオイルシールの第1突起周辺の拡大断面図である。図2(c), (d)は、本発明の第1の実施形態に係るオイルシールの第2突起周辺の拡大断面図である。

【図3】図3(a)は、本発明の第2の実施形態に係るオイルシールの第1突起周辺の拡大断面図である。図3(b)は、本発明の第2の実施形態に係るオイルシールの第2突起周辺の拡大断面図である。

#### 【符号の説明】

1, 10 オイルシール

2 シリンダ

20 シリンダ内周面

41 嵌着部

42 嵌着部周面

50, 150 第1突起

51 第1搔き落とし面

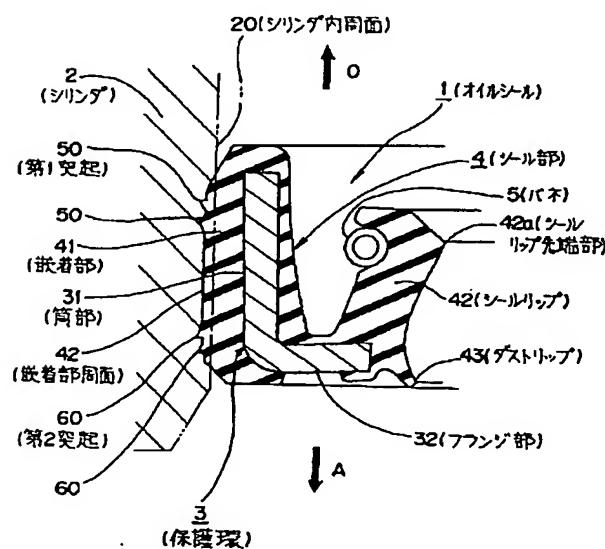
52 第1背面

60, 160 第2突起

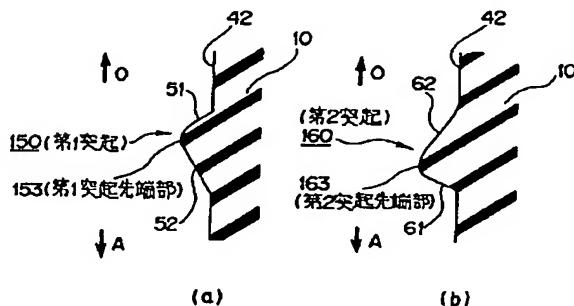
61 第2搔き落とし面

62 第2背面

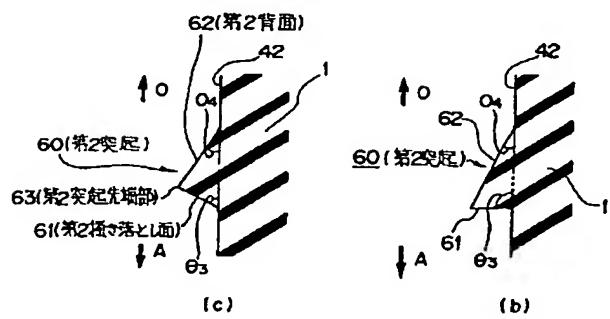
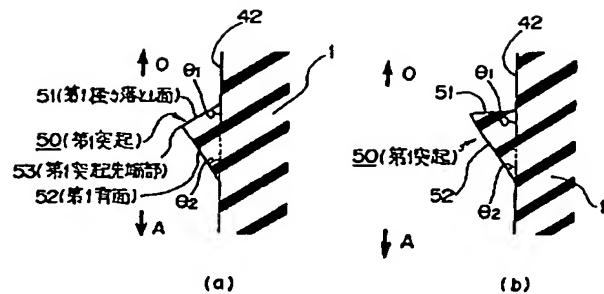
【図1】



【図3】



【図2】



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